

CLAIMS

1. An optical DNA sensor comprising:
a solid imaging device, and
a plurality types of DNA probe each including
nucleotide sequence and being arrayed and fixed on a
surface of the solid imaging device.

2. The optical DNA sensor as claimed in claim 1,
wherein the solid imaging device comprises a plurality of
photoelectric elements arranged on a substrate, and a
transparent layer for coating the plurality of
photoelectric elements, and the DNA probe are fixed on
the transparent layer, corresponding to the photoelectric
elements, respectively.

3. The optical DNA sensor as claimed in claim 1,
wherein the solid imaging device comprises a plurality of
photoelectric elements arranged on a substrate, and a
transparent layer for coating the plurality of
photoelectric elements, and each of the DNA probe is
fixed on the transparent layer, corresponding to a group
of adjacent photoelectric elements the number of which is
"A" where "A" is an integer of 2 or more.

4. The optical DNA sensor as claimed in claim 2

or 3, wherein each of the photoelectric elements is of a field effect transistor type having a semiconductor layer which generates electric charges by receiving light.

5. An optical DNA sensor comprising:
 - a solid imaging device,
 - an excited light absorbing layer formed on a surface of the solid imaging device, and
 - a plurality types of DNA probe which include nucleotide sequence and are aligned and fixed on the excited light absorbing layer.

6. An optical DNA sensor comprising:
 - a solid imaging device,
 - a transparent conductive layer which is formed on a surface of the solid imaging device and has a charge density of 1.0×10^{20} [$1/\text{cm}^3$] or less, and
 - a plurality types of DNA probe which include nucleotide sequence and are aligned and fixed on the transparent conductive layer.

7. An optical DNA sensor comprising:
 - a solid imaging device;
 - a dielectric multilayered film comprising a plurality types of dielectric layers with refractive indexes different from each other, which are alternately

laminated on a surface of the solid imaging device, an optical film thickness of each of the dielectric layers being equivalent to one fourth of a wavelength of a phosphor exciting light; and

a plurality types of DNA probe which include nucleotide sequence and are aligned and fixed on the dielectric multilayered film.

8. An optical DNA sensor comprising:

a solid imaging device comprising: a plurality of photoelectric elements which are arranged apart from each other on a surface of a transparent substrate and include a bottom gate electrode 21 having a shading property, a semiconductor layer having a light sensitivity, a light-transmissive top gate electrode, which are layered on the transparent substrate in this order; and a light-transmissive protective layer for coating the plurality of photoelectric elements; and

a plurality types of DNA probe which include nucleotide sequence and are aligned and fixed on the protective layer.

9. A DNA reading apparatus comprising:

an optical DNA sensor comprising a solid imaging device, and a plurality types of DNA probe each including nucleotide sequence and being arrayed and fixed on a

surface of the solid imaging device; and
a driving unit for attaching the optical DNA sensor
detachably and for driving the solid imaging device.

10. A DNA reading apparatus comprising:

an optical DNA sensor which comprises:

a solid imaging device which comprises: a plurality of photoelectric elements which are arranged apart from each other on a surface of a transparent substrate and include a bottom gate electrode having a shading property, a semiconductor layer having a light sensitivity, a light-transmissive top gate electrode, which are layered on the transparent substrate in this order; and a light-transmissive protective layer for coating the plurality of photoelectric elements; and

a plurality types of DNA probe which include nucleotide sequence and are aligned and fixed on the protective layer; and

a light irradiation member for irradiating a phosphor exciting light like a plane of light toward a rear surface of the transparent substrate of the optical DNA sensor.

11. A DNA reading apparatus as claimed in claim 10, wherein the light irradiation member is disposed below the optical DNA sensor.

12. A DNA reading apparatus as claimed in claim 11, wherein the light irradiation member irradiates the phosphor exciting light to the DNA probe through the solid imaging device.

13. A DNA reading apparatus as claimed in claim 11 or 12, wherein the DNA probe is able to bond to an appropriate sample DNA having a fluorescent substance, the fluorescent substance is excited by the phosphor exciting light and emits a light is different in wavelength from the phosphor exciting light, the phosphor exciting light of the light irradiation member having a wavelength in a range which makes difficult for exciting the solid imaging device in comparison with the light emitted from the fluorescent substance.

14. A DNA identification method for identifying the sample DNA segment by using an optical DNA sensor, wherein the optical DNA sensor comprises:

a solid imaging device comprises a plurality of photoelectric elements arranged on a substrate, and a transparent layer for coating the plurality of photoelectric elements; and

a plurality types of DNA probe each including nucleotide sequence and being arrayed and fixed on a

surface of the solid imaging device; and
the method comprising the steps of:
bonding a sample DNA segment to a complementary DNA probe among the plurality types of DNA probe by applying the sample DNA segment which was labeled with a fluorescent substance or a photoresonance scattering substance, on the transparent layer;
irradiating an exciting light to the plurality types of DNA probe; and
detecting an intensity of light from the fluorescent substance or the photoresonance scattering substance with the sample DNA segment bonded the complementary DNA probe.

15. A method for manufacturing a solid imaging device, comprising:

forming a conductive layer on a surface of a solid imaging device which comprises a plurality of photoelectric elements arranged on a substrate, and a transparent layer for coating the plurality of photoelectric elements; and

fixing DNA probe on a surface of the solid imaging device in a state of applying a voltage to the conductive layer.